Advanced Solid Mechanics

Project Guidelines 2021-2022

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1^{rst} Aerospatial and Mechanical Masters and Isolated Students
MECA-0023

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General Remarks

You will be working on your projects in groups of **four** students.

This project aims at modeling a mechanical problem involving small deformation and elasto-viscoplasticity. The purpose of this work is also to develop a critical approach towards the results obtained with a non-linear finite element software (Metafor).

Consequently, the project evaluation will take into account :

- the methodology chosen to analyze the problem.

- the interpretation and the analysis of results obtained with Metafor.

- the quality of the report.

Report

- The report must be professionally written with much care using a word processor such as Microsoft Word or LaTeX. It must be converted to pdf format. This pdf must be completely unlocked and the text must be selectable. The pdf name should be ASM_REPORT_GROUP_ "group number"_2021.

- Each group must submit a workload balancing sheet. This file will mention all of the sections of the report that you have written as well as a concise summary of what each group member has done. All members should agree with the content of the document and **sign it** (no signed document = no grade). The name of this file should be ASM_WORKLOAD_GROUP_ "group number"_2021.

- A .zip folder containing the report, the workload sheet, and your code needs to be uploaded to the eCampus platform or sent (**only if there are problems with the eCampus platform !**) by email to the following address cedric.laruelle@uliege.be, on the deadline. The name of this folder should be ASM_PROJECT_GROUP_ "group number"_2021.

- The deadline is 10 December 2021 before 16h00.

- General layout :

  - The text font size is **12**.
  - The text font is either Times New Roman or Arial.
  - Use italic for emphasizing a word or a phrase.
  - Number all the pages of your report.
  - Indent the text at each new paragraph.
  - Double-check your spelling and grammar.
  - Justify the text !

- The report must be clearly structured :

  - **Title page** : The title page should include at least the course title, the project title, the group number, the first and last names of each group member as well as the academic year.
  - **Table of contents, figures and tables**
  - **Introduction** (a few pages) : The introduction briefly describes your problem and the structure of your problem.
  - **Main text** (Maximum **50** pages): The text of your report should be divided into sections, subsections, etc. You should include an introduction at the beginning of each section and include a summary at the end of each section. You should divide your text into several paragraphs to improve the readability of the report ! In general, a paragraph contains an observation, a description or an explanation. Do not explain in details the theory that is taught in class! Instead, you may add references to the theoretical lectures in your text. During your numerical study, you may summarize some theoretical results that could explain your numerical results and observations.
  - **Conclusion** (a few pages): The conclusion summarizes your results and the work done. The conclusion should not contain any new information compared to the main text of your report. Your whole work should be understandable by a reader who only reads your introduction and conclusion texts.
  - **References** : All your sources of information (books, articles, lecture notes, websites, ...) must be included in the bibliography . Each reference must be cited in the text under the following form [1].

- Equations

  - Each equation must be numbered.
  - Each mathematical symbol must be defined clearly and precisely, when first introduced in the text.
  - The units of each mathematical symbol must be mentioned under the following form [MPa], when first introduced in the text. Each unitless symbol is indicated as [-].
  - Each equation must be referred in the text under the following form Eq. 1.
  - Equations should be punctuated as if they were an ordinary part of the text. Punctuation appears after the equation but before the equation number.
  - Each equation must be well written.

- Figures/Tables :

  - Each figure and table must be numbered and contain a centered caption, describing what is shown in the figure or table : The syntax rule also apply to the caption text, namely don't forget to add a point at the end of this text. The legend content should be self-consistent.

  - Each figure and table must be referred in the text under the following form Fig. 1 and Table 1, respectively.

  - Each figure and table introduced in the main text of your report must be commented.

  - The reader should be able to reproduce each figure of your report if he wants to do so. It means that all the parameters related to a given plot or picture must be clearly mentioned somewhere in the text, the caption or the legend.

  - Specify the material point where the scalar (von Mises' equivalent stress), vectorial (displacement field) or tensorial (stress field) field is evaluated.

  - Curve plots :

    * Use vector formats instead of bitmaps for curve plots. For LaTex, use the encapsulated postscript format (.eps). For Word, you may simply copy/paste your figures from Matlab or Excel.

    * Do not forget to specify the units everywhere.

    * The size of the text used for axis labels, legends and annotations in the figures must be similar to the one used for the main paragraph text. (cf. *Fontsize* keyword in Matlab).

    * Choose carefully the range of values that is displayed on the axes (cf. *xlim* and *ylim* command in Matlab).

    * Thicken the lines if necessary (cf. use *LineWidth* keyword in Matlab).

    * Use a legend if several curves are plotted together (cf. *legend* command in Matlab).

    * Use a grid if it improves the readability of the figure (cf. *grid* command in Matlab).

    * Do not use colors which look similar in the same plot.

    * Limit the number of curve plots by plotting several curves in the same curve plots: if you plot variables with different order of magnitude, multiply one of them by a scaling factor in order to improve the readability of the displayed variables.

  - Results on meshes

    * Use bitmaps with a sufficiently high resolution (enlarge the 3D-view window if needed, then take a screenshot). If you save your screenshot to disk, avoid JPG and prefer a lossless format such as PNG.).

    * A scalar or vectorial field is always displayed on a mesh.

    * If a scalar or vectorial field is displayed on your mesh with colors, a scalar bar must be shown somewhere.

    * If several figures are compared to each other, choose the same range of values.

    * Choose carefully the range of values that are displayed (uncheck "auto" in the "Scalar-Values" tab of the "Config" window!).